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DRAWINGS ATTACHED

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1 225 035

(54) OPTICAL VIEWING SYSTEMS

(71) We, BARR AND STROUD LIMITED, a British Company of Caxton Street, Anniesland, Glasgow, W.3, Scotland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to optical viewing systems.

The object of the invention is to provide a system which may be used in different roles as a monocular, binocular or photographic system.

The present invention is an optical viewing system, selectively adjustable for binocular use, photographic use, and monocular use, the optical viewing system including a body, a pair of rhomboid prisms disposed in the body in parallel planes lying at right angles to the axis along which light from an object to be viewed enters the system, this axis being hereafter referred to as the main optical axis, the first prism being provided with a beam splitting surface and a reflecting surface and the second prism being provided with two reflecting surfaces, the beam splitting surface of the first prism and one of the reflecting surfaces of the second prism being centered on the main optical axis, a first eyepiece mounted in the body and disposed to receive light from one of said prisms, means for selectively pivoting the other of said prisms about the main optical axis between a first angular position and a second angular position, a second eyepiece disposed to receive light from said other of said prisms when in said first angular position, a camera position disposed to receive light from said other of said prisms when in said second angular position, and means for selectively pivoting the said one prism out of the main optical axis.

An embodiment of the present invention will now be described, by way of example, with reference to the drawings accompanying the provisional specification in which:—

Fig. 1 is a side view of the optical viewing system as adapted for photography showing the main components in section and showing the position of the plane of each prism through its longitudinal centre line;

Fig. 2 is an end elevation of the device looking in direction of arrow A of Fig. 1, partly sectioned for clarity and showing in phantom the prisms in various position;

Fig. 3 is a plan view of part of the system sectioned along the line O-O in Fig. 1 which shows the rotation means of one of the prisms;

Fig. 4 is a view looking in direction of arrow B of Fig. 3 and showing a mechanism for coupling a prism and its associated eye piece.

In this embodiment the axis 'O-O' along which light from the object to be viewed enters the device, will be known as the main optical axis.

Two rhomboid prisms 1 and 2 of substantially equal size and shape are mounted one behind the other with one reflecting surface of each centered on the main optical axis. For binocular use, the prisms are disposed downwardly from the main optical axis in parallel vertical planes which lie at right angles to the main optical axis such that the prisms are equally inclined to but on opposite sides of the vertical plane passing through the main optical axis, the prism 1 being disposed to the right and the prism 2 to the left when viewed in the direction of the arrow A. The first reflecting surface 3 of the prism 2 has a transmission/reflection ratio of, in this embodiment, 70/30 and serves as a beam-splitter. The second reflecting surface 4 of the prism 2 and both reflecting surfaces 5 and 6 of the prism 1 are substantially 100% reflecting.

An eye piece having a plurality of lenses is centred on the axis of reflection of the

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bottom reflecting surface of each prism giving a right and left eye piece, 7 and 8 respectively.

The prism 1 associated with the right eye piece 7 is mounted in a holder 9 attached near one end thereof to a shaft 10 rotatable about the main optical axis. Referring to Fig. 3, the shaft 10 has a gear 11 which engages a first gear 12 on a main driving shaft 13, located to the left of the main optical axis, and which may be rotated manually by means of an external setting lever 14 bringing the holder 9 and the prism 1 into either of two positions determined by a mechanism which will be described later.

The mounting 15 of the right eye piece is attached to a support bracket 16 rotatable about the driven shaft 10, i.e. rotatable about the main optical axis.

A gear 17 on the support bracket 16 engages a gear 18 connected with an external rotatable lever 26 located below and to the right of the right eye piece.

Referring to Fig. 4, a roller 29 is mounted on the centre line of the holder 9 near one end of the holder 9 to a parallel boss 30 carried by the holder and disposed substantially coaxially with the shaft 10 (not shown in Fig. 4). A bracket holds a spring 27 and a roller 28 whose longitudinal axis is parallel to and on the same horizontal plane as the shaft 10, so that the roller 28 is urged into abutment with the roller 29. The mechanism provides two stable positions for the holder 9, one where the holder 9 and its associated prism 1 are disposed upwardly at an angle to the main optical axis and the other, shown in Fig. 4, where the holder 9 is disposed downwardly at an angle to the main optical axis. When the holder 9 is in the latter position it abuts near its bottom corner a stop 30 in the support bracket 16, the stop serving to hold the holder 9 in engagement with the support bracket 16.

The detailed operation of the mechanism of Fig. 4 on rotating the holder 9 from one stable position to another is as follows. The shaft 10 and the holder 9 are rotated in the desired direction by means of the external setting lever 14 causing the roller 29 to be rotated into more intimate contact with the roller 28 and forcing the roller 28 inwardly of its bracket against the action of the spring 27. Thus the spring 27 is opposing rotation out of the stable position. As rotation continues, a point is reached at which the roller 28 has reached its maximum inward position with respect to its bracket. At this point the rollers 28 and 29 lie generally in the same horizontal plane. On further rotation, the roller 29 is moving in a direction away from the roller 28 so that the spring 27 tends to assist rotation until the second stable position is reached. At this point further rotation is prevented by means of an abutment or stop, e.g. stop 30.

The prism 2 associated with the left eye piece 8 is mounted in a holder 19 attached to a quadrant 20 rotatable about the axis through the centre of the left eye piece parallel to the main optical axis. This quadrant 20 is geared to a second driving shaft 21 located below the left eye piece, which may be rotated manually by means of an external setting lever 22.

Supplementary lenses 23 are located in the right hand eye piece so that they normally lie outside the optical path. These lenses are connected with an external head which enables the lenses to be moved into the optical path if desired.

Mounted above the main optical axis is a camera body 24 without the usual lens and with its aperture 25 facing generally toward the object along an axis parallel to the main optical axis.

For binocular use the prisms 1 and 2 are disposed in positions 1′ and 2′ shown in Fig. 2, the device operating as follows. Light from the object being viewed impinges on the first reflecting surface 3 of the prism 2. 70% of the light is transmitted to the first reflecting surface 5 of the prism 1, this surface reflecting all the light impinging on it via the reflecting surface 6 of the prism 1 into the right hand eye piece 7. The remaining 30% of the light from the object is reflected onto the reflecting surface 4 of the prism 2 from its first reflecting surface 3, surface 4 totally reflecting the light into the left hand eye piece 8.

With the main driving shaft 13 in the position for engagement of the holder 9 with the support bracket 16 associated with the right eye piece 7 as in Fig. 4, the eye piece 7 and its associated prism 1 may be pivoted together about the main optical axis 'O-O' along the curve C shown in Fig. 2 by rotating the external lever 26. Thus the interocular distance may be adjusted to suit.

When used for photographic purposes the main driving shaft 13 and shaft 10 are rotated by means of the lever 14 to disengage the holder 9 from the support bracket 16 and swing the prism 1 associated with the right eye piece 7 round independently of the eye piece 7 into a position as shown in Fig. 1 and indicated as 1″ in Fig. 2, so that the aperture 25 of the camera 24 is centred on the axis of reflection 'P-P' from the reflecting surface 6 of this prism.

Light impinging on the prism 1 is now diverted upward, reflected from the reflecting surface 6 into the camera 24. Light reflected through the prism 2 is as before directed into the left eye piece 8. Referring to Fig. 1, the horizontal broken line 'Q-Q' indicates the axis of reflection from the surface 4 of the prism 2 to the left eye piece 8 which is directly behind and hidden by the right eye

piece 7. The left eye piece, receiving less light than the camera may be used as a viewfinder for the camera.

For viewing under low light conditions, monocular use of the device is desirable. The prism 2 associated with the left eye piece 8 is pivoted out of alignment with the main optical axis into a position 2″ shown in Fig. 2 by rotating its associated setting lever 22. The prism 1 is disposed in position 1′ as for binocular use. All the available light from the object is now directed to the right eye piece 7. In order to restore focussing which was lost on removal of the prism 2 the supplementary lenses 23 are moved into place by adjusting the associated external head.

Instead of the above arrangement whereby the movement of the supplementary lenses 23 is independent of the movement of the prism 2, the supplementary lenses 23 and the prism 2 may conveniently be mechanically coupled to allow the introduction of the lenses 23 into the optical path to be effected simultaneously with the removal of the prism 2 from the optical path and vice versa.

It is intended that the viewing system described should be used as an attachment to a telescope or periscope and would not, therefore, require a separate objective lens.

WHAT WE CLAIM IS:—

1. An optical viewing system, selectively adjustable for binocular use, photographic use, and monocular use, the optical viewing system including a body, a pair of rhomboid prisms disposed in the body in parallel planes lying at right angles to the axis along which light from an object to be viewed enters the system, this axis being hereafter referred to as the main optical axis, the first prism being provided with a beam splitting surface and a reflecting surface and the second prism being provided with two reflecting surfaces, the beam splitting surface of the first prism and one of the reflecting surfaces of the second prism being centered on the main optical axis, a first eyepiece mounted in the body and disposed to receive light from one of said prisms, means for selectively pivoting the other of said prisms about the main optical axis between a first angular position and a second angular position, a second eyepiece disposed to receive light from said other of said prisms when in said first angular position, a camera position disposed to receive light from said other of said prisms when in said second angular position, and means for selectively pivoting the said one prism out of the main optical axis.

2. An optical viewing system as claimed in claim 1, in which the means for pivoting said other of said prisms about the main optical axis includes a main driving shaft rotatable on an axis parallel to the main optical axis, a driven shaft rotatably mounted on the main optical axis, the driven shaft being geared to the main driving shaft and being rigidly connected with the other of said prisms for rotation thereof, and an external setting lever connected to the main driving shaft for manual rotation thereof.

3. An optical viewing system as claimed in claim 1 or 2, including means for pivoting the second eyepiece about the main optical axis and in which engagement means are provided for engaging said other of said prisms with the pivot means of the second eyepiece when said other of said prisms is in said first angular position and maintaining this engagement over a range of interocular separation whereby the second eyepiece and said other of said prisms may be pivoted in combination.

4. An optical viewing system as claimed in claim 3, in which the means for pivoting the second eyepiece includes a support bracket connected with the second eyepiece, pivotable about the main optical axis and geared to an external lever for manual rotation.

5. An optical viewing system as claimed in any preceding claim including supplementary lenses provided in the eyepiece associated with the second prism, the supplementary lenses being pivotable selectively in and out of the optical path passing through the associated eyepiece.

6. An optical viewing system as claimed in any preceding claim, in which the first prism is connected with a quadrant pivotable about the axis of the eye piece associated with the first prism, the quadrant being geared to a driving shaft having an external setting head and the pivoting of the supplementary lenses being effected by an external setting head.

7. An optical viewing system substantially as hereinbefore described with reference to and as shown in the drawings accompanying the provisional specification.

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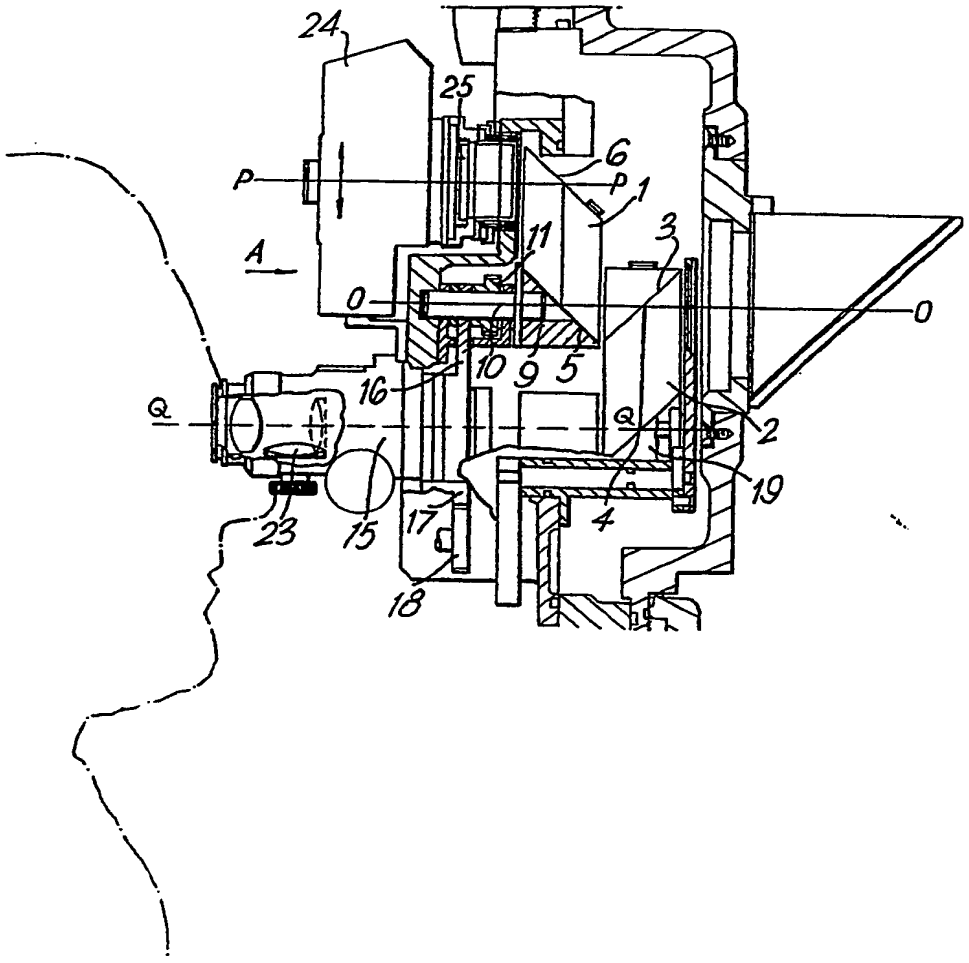
1,225,035 PROVISIONAL SPECIFICATION
3 SHEETS

This drawing is a reproduction of the Original on a reduced scale.
SHEET 1

Fig.1.



1,225,035 PROVISIONAL SPECIFICATION
3 SHEETS

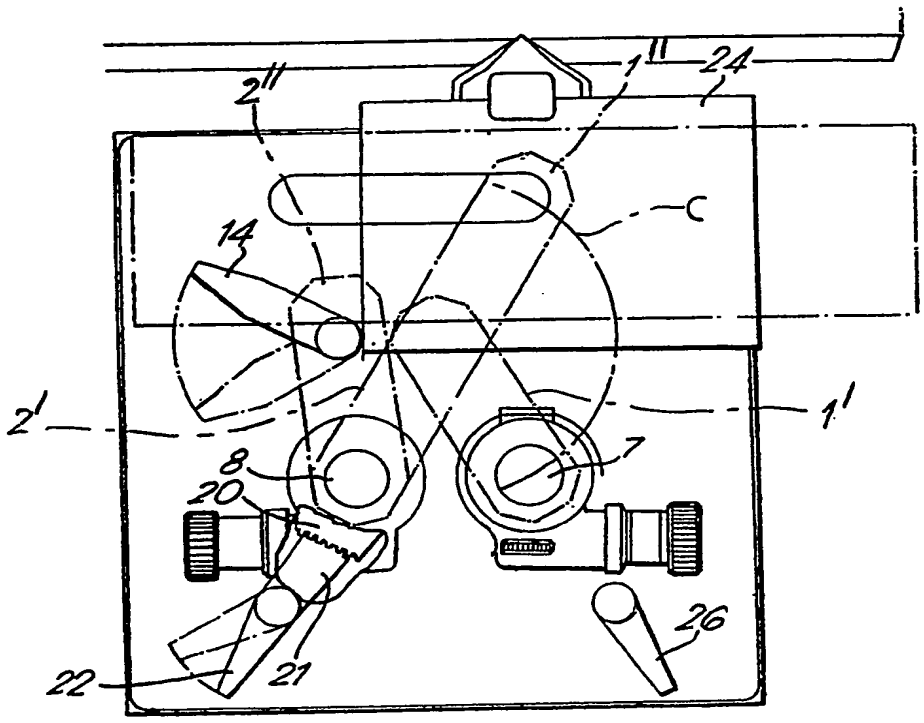


Fig. 2.

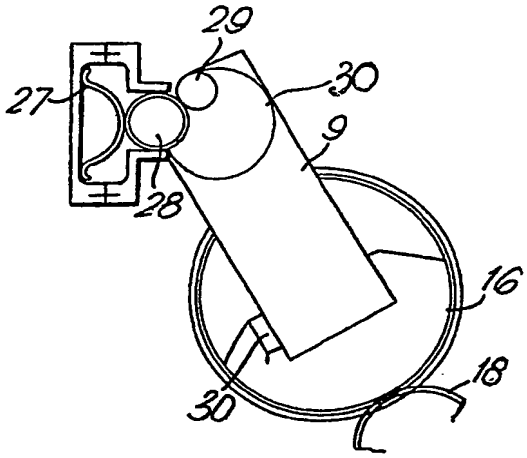


Fig. 4.

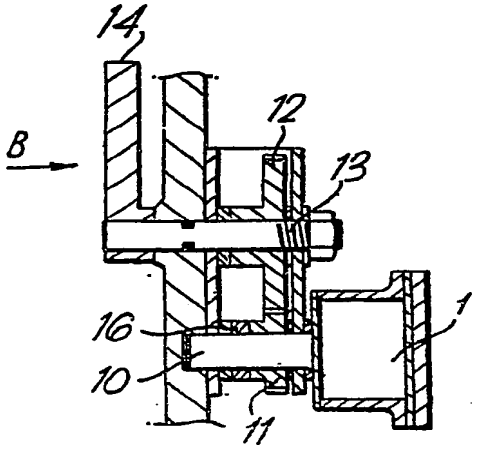


Fig. 3.